This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

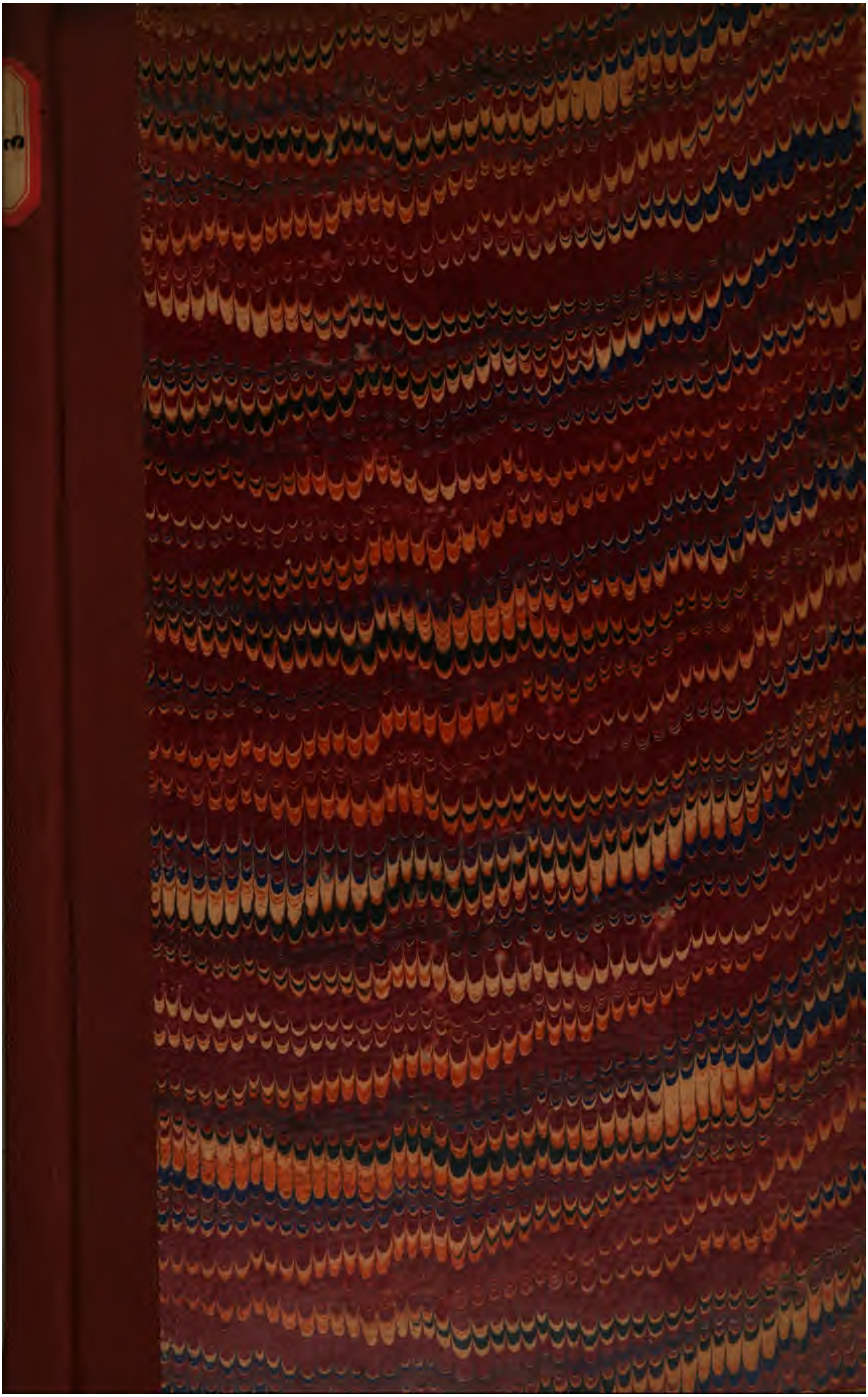
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`



Chem 8008.56.3

Harvard College Library

FROM

Prof. E. N. Horsford,
of Cambridge.

24 March, 1886.

SCIENCE CENTER LIBRARY

VII. 1128

BURNETTIZING,

OR THE PROCESS

FOR PREVENTING THE RAPID DECAY OF TIMBER

BY THE USE OF

CHLORIDE OF ZINC,

WITH A

BRIEF ACCOUNT OF SOME OF THE OTHER PROCESSES USED
FOR THE SAME PURPOSE,

AND OF THE

DEODORIZING AND PURIFYING USES

OF THE CHLORIDE OF ZINC.

CAMBRIDGE:
PRINTED BY ALLEN AND FARNHAM.
1856.

Chem 8008.56.3

1886 Mar. 24.
Gift
of E. N. Horsford
of Cambridge

PRESERVATION OF TIMBER FROM DECAY.

THE liability of nearly all kinds of timber in common use to rapid decay, when exposed to alternate wet and dry, or when placed in damp and badly ventilated situations, has led to various devices for the purpose of increasing its durability under such circumstances. A late English publication contains a list of forty-seven patents that have been taken out for "preserving animal and vegetable substances, including timber;" the earliest is in the year 1737, and the latest in 1849, all but four being within the present century.

The first that went into general use was Kyan's process, patented in England in 1832, and soon after in this country. This process, called Kyanizing, consists in immersing the wood in a dilute solution of corrosive sublimate, until it is thoroughly saturated; or if haste is an object, injecting the solution by pressure in a closed vessel, from which the air is first partially exhausted. This process was very extensively adopted in England, and to some extent in this country. It was undoubtedly a valuable invention, and when faithfully executed it seemed effectually to arrest the rapid decay of timber in exposed situations. The difficulty of carrying on the process in any way excepting by immersion in open tanks (which is intolerably tedious), arising from the powerful action of the solution upon the common metals; the great cost of the material used; and no doubt, to some extent, the introduction of other processes, has led to the abandonment of

Kyanizing in this country. In England, also, it has been given up, where, in addition to the causes operating in this country, the gross frauds practised by the company owning the patent, and by parties carrying on the process, threw a discredit upon it, which with fair dealing it would not have been subject to.

In 1837, a patent was taken out in England by Margary, for preserving timber, etc. by immersing it in a solution of acetate or sulphate of copper. This process has been used extensively in England, and it is said to be effective; it has not maintained its ground, however, latterly.

In 1838, Bethell's process was patented in England. It consists in impregnating the timber with an oily matter obtained by a rough distillation from coal tar; this oily matter contains a variety of substances having different chemical properties; the essential ingredient for this purpose is said to be creosote, which forms about eighteen per cent. of the product of distillation used for this purpose; some think, however, that the other ingredients have an important effect. The oily matter is injected into the timber by pressure in closed vessels, from which the air is first partially exhausted. This process is now used in England very extensively, principally for railroad purposes; it is understood that a great majority of the railroad companies prepare their sleepers by this process. It is undoubtedly an effective preservative from rapid decay; even in England it is considered an expensive process; in this country it does not appear to have been used at all; the expense here must be much greater than in England, where the universal use of coal gas renders the material used comparatively abundant and cheap. This process renders wood more combustible, which would be far from desirable in this climate. For sleepers, however, it is well worthy of trial, where the creosote can be obtained without too great difficulty and expense. It is said to be an effective protection from marine worms.

In 1841, Payne's process was first patented in England; it consists in using two solutions in succession, which mutually decompose each other, and form an insoluble substance in the pores of the wood. The earthy or metallic solution is first introduced into the timber, under pressure; this solution is then drawn off, and the decomposing fluid is forced in. In this manner sulphate of iron and carbonate of soda are said to form an insoluble compound in the pores of the wood, and to act as a preservative from decay and from the attacks of insects, and also to render the wood less combustible. This process has been extensively used in England and France, and to a small extent in this country. In England, it has not maintained itself; in France, it has met with more favor.

Dr. Boucherie, an eminent French chemist, has invented a process for preserving wood from decay, for which he has a patent. For this process it is claimed, that it accomplishes two objects: first, that of expelling the sap; and secondly, filling the pores of the timber with a preservative solution.

The manner in which this is effected, is by applying the preserving fluid under pressure, so as to cause it to pass longitudinally along the fibres. The preserving fluid thus forces the sap out before it, and occupies its place.

It is further stated, that Dr. Boucherie's process has been attended with complete success. The apparatus employed is of an inexpensive character, and may be erected in a few days; it is capable of application on the most extended scale; and it is, in fact, very extensively employed at this time in preparing sleepers and telegraph posts for the French railways.

Dr. Boucherie's invention seems to be confined to the method of applying the preservative solution, and to driving out the sap.

In 1838, a patent was granted in England to Sir William Burnett, for a process for preventing decay in certain vegetable and animal substances by the use of chloride of zinc. This process, called Burnettizing, has been extensively used in England as a preventive of the decay of timber; and it has been more extensively used in this country for the same purpose than any other process. No patent was taken out for the United States. It was first introduced at Lowell, Massachusetts, where, in 1850, the Proprietors of the Locks and Canals on Merrimac River, at the joint expense of the manufacturing companies, erected the necessary apparatus for carrying on the process. The original intention was to prepare timber only for their own purposes; it was soon found, however, that the apparatus was capable of preparing much more, and that a more extended use would diminish the cost. Accordingly large quantities of lumber of various kinds have been prepared for others, principally for the Lowell Bleachery, and the railroad companies in the vicinity.

The charges now are —

For spruce lumber, .	$5.00	per 1000 ft. bd. measure.
For all other kinds of lumber,	6.00	“ “ “ “
For spruce shingles, .	.67	per 1000.
For other kinds of shingles,	.75	“

For lots of lumber of 100,000 feet or more, special contracts are made, usually fifty cents per thousand less than the above prices.

Spruce is prepared at a lower price, as it takes up much less of the chloride of zinc than pine, or other kinds of timber in common use.

About a million of feet board measure have been Burnettized annually since 1850 at this establishment. There has been scarcely time yet to show fully the results of the process here; enough has been seen, however, to show very clearly, that although it is not in all cases a preventive of decay, the advantages are more than sufficient to justify its application to most kinds of timber in common use, when placed in situations favorable to rapid decay. It has also a distinct effect in rendering wood less liable to warp and crack when placed in dry situations.

The apparatus at Lowell consists of a cast-iron cylinder, in which the timber to be prepared is placed; this cylinder is sixty feet long, and five feet diameter inside, with one head movable; the iron generally an inch thick. A pair of rails, about two feet gauge, are laid in the bottom of the cylinder, and also on the same line and level, about seventy-five feet outside the cylinder; a low truck, about sixty feet long, runs on these rails. When it is required to charge the cylinder with timber, this truck is drawn out, loaded, the load chained down to prevent its floating, and the truck then drawn into the cylinder.

A little below the level of the cylinder, and parallel to it, is placed a wooden cistern, to hold the solution while the cylinder is being loaded and unloaded, and at times when the apparatus is not in use; this cistern is about fifty feet long, seven feet wide, and four feet deep, and was originally constructed for Kyanizing by immersion. The air-pump is twelve inches in diameter, and three feet stroke. The force-pump four inches diameter, and two feet stroke. The pumps are worked by a small steam-engine of about fifteen horse-power, which also works the windlass by which the truck is drawn in and out of the cylinder. The boiler of the engine is also used in winter to supply steam to thaw frozen timber; this is done by admitting steam into the cylinder, charged with the frozen timber, for several hours before the vacuum is obtained. The steam-engine and boiler are both much larger than necessary for these purposes.

The process is as follows: —

	Time occupied.	
	Hours.	Min.
The truck being outside the cylinder, is unloaded and reloaded with about seven thousand feet, board measure, of lumber, usually of various kinds and dimensions; from one to two hours is usually thus occupied, depending upon the dimensions and variety of sizes, — average, say	1	30
Drawing in the truck and packing cylinder head		15
Exhausting the air, and maintaining a vacuum of twenty-seven or twenty-eight inches of mercury		45
Changing pumps, and at the same time filling the cylinder by atmospheric pressure from the cistern, with a solution of one hundred parts of water and one and a half parts of dry chloride of zinc by weight, and getting up the pressure in the cylinder to one hundred and thirty pounds to the square inch above the atmosphere		20
The pressure of one hundred and thirty pounds to the square inch above the atmosphere is maintained	2	30
Draining off the surplus solution by gravitation from the cylinder to the cistern	1	45
Unpacking head and drawing out truck		15
Time occupied in preparing one batch	7	20

By allowing the solution to drain off during the night, two batches per day are easily done.

Whenever it is required to prepare large quantities of timber, uniform in kind and dimension, such as railroad sleepers, an improvement in the above process would be, to maintain the pressure until a certain quantity of the solution was taken up; with the great variety in kind and dimension usually prepared at the same time at the Lowell establishment, this is impracticable; as there conducted the lumber of small thickness gets more than its due proportion, and the pressure is kept up so long in order that the larger sizes may be sufficiently saturated.

The chloride of zinc is received from the manufacturers in the form of a concentrated solution containing about 55 per cent. of the dry chloride. The amount taken up by the wood varies very much, depending upon the kind, dimensions, and dryness of the wood; as the process is conducted at Lowell, it varies from about ten pounds to forty pounds of the concentrated solution to a thousand feet board measure, or say from two to eight ounces to a cubic foot.

Memorandum on the Burnettizing Establishment at Gloucester, England, carried on under the direction of J. K. Brunel, the eminent Engineer. By James B. Francis.

In June, 1851, I visited an extensive establishment for Burnettizing timber at Gloucester, which was in active operation preparing timber for railway purposes.

The timber, in course of preparation, was principally the white or Canadian pine for the longitudinal sills commonly used in England for the continuous bearing of the bridge rail, the dimensions of the sills being thirty feet long, seven by fourteen inches.

There are at this establishment five cylindrical tanks of boiler iron, each about sixty feet long and six feet in diameter; narrow railway tracks are laid through the tanks, on which run small trucks on which the timber is loaded; several trucks are usually used for each charge. One head of the tank is entirely removed when a charge is put in or withdrawn, and a manhole through the other head gives ready means of applying a windlass for moving the loaded trucks.

After the heads are packed, a partial vacuum (usually from twelve to sixteen inches of mercury) is obtained, by means of air-pumps driven by steam power; this is maintained about twenty minutes; the dilute solution of chloride of zinc is then permitted to flow in; this occupies about eight minutes; the force-pumps are then applied, requiring about fifteen minutes to get up the pressure, which was stated to be one hundred and twenty pounds to the square inch; this pressure is maintained until the timber has taken up thirty imperial gallons of the dilute solution to each load of fifty cubic feet, and requiring from two to four hours, depending upon the size and state of dryness of the timber. It was considered important that all timber in the same charge should be of nearly uniform size and dryness, as otherwise the smaller and dryer timber would take up an undue share of the solution, and leave the larger and less dry timber with less than thirty gallons to the load.

The quantity of solution taken up by the timber is ascertained by noticing the depths in the cistern from which it is pumped; after the pressure is once obtained, it is kept up until the proper quantity is taken up.

It was stated by the resident engineer, that the concentrated solution was purchased of the proprietors of Burnett's patent, at the rate of threepence sterling per imperial pint, each pint giving on evaporation one pound of dry chloride of zinc. There was also usually paid a royalty of two shillings and sixpence sterling per load, for the patent right; but this was of course subject to special agreement. The concentrated solution is transported in jars of stoneware, holding seven gallons each; these are charged at five shillings sterling each, which is allowed, however, when they are returned. The strength of the dilute solution as used, was stated to be one gallon of the concentrated solution to thirty gallons of water, for all timber prepared for the Vale of Neath Railway, and one gallon to forty gallons for the timber prepared for the Oxford, Worcester and Wolverhampton, and the Oxford and Birmingham Railways. Omitting the small quantity of water contained in the concentrated solution, the dilute solution for the Vale of Neath Railway, is two and two thirds pounds of dry chloride to one hundred pounds of water, and for the other two railways, two pounds to the hundred; and the amount of dry chloride taken up by the timber for the Vale of Neath Railway, is about one sixth of a pound to the cubic foot, and by the timber for the other two railways, about one eighth of a pound to the cubic foot. If the concentrated solution is 55 per cent. dry chloride, this is 4.65 ounces of the concentrated solution to the cubic foot for the Vale of Neath Railway, and 3.49 ounces to the cubic foot for the others.

The process was all done by a contractor, who also owned the apparatus; every part of the process was, however, done under the immediate supervision of persons employed by Mr. Brunel, and as far as I could judge, it seemed to be faithfully and thoroughly done.

It was stated that the contractor received sixteen shillings sterling per load of fifty cubic feet; which is equivalent to $6.40 per thousand feet board measure.

Numerous testimonials of the beneficial effects of Burnettizing might be given. The following, from the agent of the Lowell Bleachery, is very striking. This great establishment, bleaching and dyeing more than twenty millions of yards of cotton goods annually, have on their premises what is equivalent to a large village of wooden buildings; and from the nature of the processes carried on in them, a large portion of them are subject to such rapid decay as seriously to affect the profits of the concern. The experience of the last six years indicates that Burnettizing is the remedy.

It must be remarked, however, that in two or three instances, decay has manifested itself to such an extent, as to amount to a failure. The most remarkable case is the Charles River Bridge on the Boston and Lowell Railroad, a pile bridge of several hundred feet in length, over an arm of the sea near Boston. The superstructure of this bridge was rebuilt in 1850, principally of second growth or sapling pine; this is the white pine that has grown up rapidly on land from which the original growth has been cleared; and it has a very large amount of sap wood. It was Burnettized at the Lowell establishment, but the sap wood has decayed to a great extent.

The results of Burnettizing at the Print Works of the Merrimac Manufacturing Company, as given in the following letter from Dr. Samuel L. Dana, also indicate that the second growth, or sapling pine, is not preserved by the process; and a similar result has also been observed in parts of a bridge in Lowell, built in 1850. These three instances indicate, very strongly, that as applied to sapling pine, the process is not advantageous; spruce and maple, however, which, unprepared, have very bad reputations for durability, seem to be greatly benefited. It seems quite probable that further experience will lead to a classification in this respect. It is well known that different woods vary much in their chemical constitution, and we should consequently expect different results to follow from a chemical process like Burnettizing.

LOWELL BLEACHERY AND DYE WORKS, Sept. 1, 1856.

DEAR SIR, — We have, since 1850, had about 800,000 feet of lumber Burnettized at your works. This we have used for walks, drains, runs, and buildings. Many of our rooms are wet and full of steam, and in them boards, planks, and beams not prepared by your process, decay very quickly.

Of the above amount of lumber received from you, some of it in use now for six years, we have not found one instance of rot, nor indeed any appearance of change. As special instances of the advantage of Burnettizing, our walks and dye-house floors are very striking. In 1850, we laid of Burnettized hard pine, the chief portion of the walk, which leads in the open air, from our bleachery to one of the dry sheds, a distance of some two hundred feet. Out of the same lot of lumber used for this, we retained a portion and laid it side by side with the Burnettized plank. The latter is now sound as on the day it was laid, while the former is wholly decayed.

Some years ago we built a portion of our dye-house of Burnettized stuff; one year later we laid a floor in a similar room of unprepared board; the former is perfectly sound, the latter has been entirely decayed for a year. Our ground walks laid with common spruce would not last two years; while one which we have laid in Burnettized spruce, has stood for six years, and shows no signs of rot.

We have had prepared by you, spruce and white, sapling, and hard pine, and as to freedom from decay, they are all alike after a test of from five to six years. Maple we have also tried, but not long enough to know the comparative result. All the shingles and clapboards we use are Burnettized, and with the same favorable effect.

The advantages of this process have been, and are, to us very great, and we shall have much pleasure in showing to any who may desire, the practical tests of Burnettized lumber as seen in our establishment.

I am, very respectfully, yours,

F. P. Appleton, *Agent Lowell Bleachery.*

James B. Francis, Esq., Agent Proprietors
of Locks and Canals, Lowell, Mass.

Merrimac Printery, Lowell, Sept. 9, 1856.

To James B. Francis, Esq., Agent
Proprietors of Locks and Canals.

Dear Sir, — The following comprises the results of Burnettizing, so far as timber thus prepared has been used in the print yard: —

1. White Spruce, eight by eight inches; two sticks were framed as braces between two gate posts, and set with these

in the earth in 1851. A few days since the gate was removed. The spruce, down five years, is found perfectly sound. See samples in paper A.

2. WHITE PINE, old growth, formed the posts of the gate above, not Burnettized, and as perfectly sound; but WHITE PINE, second growth, Burnettized, and used as the bottom of a fence, and painted, is found at the end of five years *generally decayed on surface.* See samples, paper B.

3. CHESTNUT, Burnettized, stringers to the above fence, and painted, is found decayed where framed into posts of Burnettized CHESTNUT, (paper C). These posts are all decayed externally where buried. Down five years.

4. SUGAR MAPLE, old growth, and very large logs, used for rollers in washing machines and mangles. This timber, whether the bark is on or off, housed or exposed, decays in about two years, and is useless for the above purposes; if this same timber is Burnettized, it remains sound under the same circumstances an indefinite period, — our experience dates back to the time you commenced Burnettizing. Rollers of this timber decay not; un-Burnettized, they are kept from rotting by the various chemical agents with which they come in contact; rarely is a partial decay (and that on the end only) seen. The rollers wear out rapidly by attrition. If new rollers are made from Burnettized MAPLE, even the partial decay is prevented, and the wood is *condensed* and *hardened*, so that such rollers *wear* very much less, and their usefulness preserved. In this view, Burnettizing is of the highest value.

I may add, that Burnettizing prevents neither decay, nor the wearing effects of attrition, when used for mangle rollers, with hot starch.

With great regard, very truly yours,

SAM'L L. DANA, *Chemist, attached to Merrimac Manufacturing Co.'s Printery.*

SPECIFICATION

Of the Patent granted to Sir William Burnett, Knight, Commander of the Royal Hanoverian Guelphic Order, of Somerset Place, Strand, in the County of Middlesex, for Destroying the Tendency of certain Vegetable and Animal Substances to Decay. Sealed July 26, 1838.

To all to whom these presents shall come, etc., etc. Now know ye, that in compliance with the said proviso, I the said William Burnett, do hereby declare that the nature of my said invention and the manner in which the same is to be carried into effect, are fully described and ascertained in and by the following description thereof, (that is to say): —

The invention consists in destroying the tendency of certain vegetable and animal substances to decay, by submitting them to the action of chloride of zinc. In preparing wood, canvas, cordage, sail-cloth, hemp, flax, wool, and other vegetable and animal matter, or articles made thereof, a tank, or other vessel of wood or other suitable material, is provided. This is to be filled about two thirds full of chloride of zinc, dissolved in cold water, in the proportion of one pound of chloride of zinc to five gallons of water; this is allowed to remain for ten or twelve hours, when the solution will be ready. The material which is to be prepared is then placed in the solution, keeping it completely covered by the liquid. If wood or timber is to be prepared, it is to remain in the solution from ten to twenty-one days, according to its size and thickness; that is to say, if the timber be of the thickness of from eight to thirteen inches and upwards, it is to be immersed in the solution for twenty-one days; if from four to eight inches thick, for fourteen days; and if less than four inches thick, for ten days. When the wood or timber has been so immersed, it is to be taken out and placed in a situation sheltered from the weather, until it becomes perfectly dry. In preparing canvas and cloth of hemp or wool, they are to be kept in the solution for forty-eight hours, and then dried under cover; and in this manner, other vegetable and animal materials of thin texture may be prepared. In the preparation of rope or cordage above the thickness of two inches, steep the hemp or yarns of which the same is to be formed, in the solution, for forty-eight hours, and all rope or cordage of two inches or less, is to be steeped in the solution for seventy-two hours. In all cases, where tar is employed, the yarns forming the cordage should be placed in the solution for forty-eight hours, and allowed to dry before undergoing the tarring process. In ship-building, and in building or repairing houses, besides preparing the timber to be used therein as above described, it is desirable to use a paint, made by grinding impure oxide of zinc (lapis-calaminaris) with oil or other suitable vehicle. This paint is recommended to be applied at the time the materials are brought into contact, to the faying parts of all scarfs, and on the joists and faying parts, wherever else two pieces of timber are brought into contact, and also on the under-sides of the flats of all magazine platforms, and all other platforms below the orlops of ships of the line, and lower decks of frigates, and below the upper decks of sloops and smaller vessels. In houses, the paint, made as before stated, is to be used for the inside of skirting and wainscotting of ground floors, and upon every part of the timber materials below the external surface of ground floors.

In witness whereof, etc.

Enrolled January 21, 1839.

SANITARY USES OF CHLORIDE OF ZINC.

Chloride of zinc is of great value as a sanitary and deodorizing agent; it is the most convenient and effective article yet discovered for removing unpleasant odors from the sick room; and it is highly appreciated for that and other purposes by physicians and surgeons who are practically acquainted with its properties.

The following documents are reprinted from English publications.

Copy of a Letter from SIR WILLIAM BURNETT, M. D., *Director-General of the Medical Department of the Navy, to the* SECRETARY OF THE ADMIRALTY.

ADMIRALTY, 20th May, 1848.

SIR, — In consequence of the numerous reports, both written and verbal, which have been made to me during the few past years respecting the application of the solution of chloride of zinc, as a disinfecting, or, at all events, as a deodorizing agent, I have been induced to request you will be pleased to lay the accompanying papers before my Lords Commissioners of the Admiralty, convinced that whatever tends to increase the comforts or to improve the moral and physical condition of all classes of men in Her Majesty's Naval Service, will meet with their Lordships' most favorable consideration.

Presuming that the value of the chloride of zinc as a preservative of vegetable fibre is now established beyond all doubt, I may be permitted to call your attention to its effects when brought into contact with noxious gas in whatever way generated, or with putrid animal or vegetable substances evolving noxious odors, either of which, if indeed they be not chemically the same, can seldom exist for any length of time in ill-ventilated rooms or in densely populated districts, without producing disease, and frequently contagious diseases. The application of the fluid to correct the fœtor of bilge-water is now in general use both in vessels of war and in merchant vessels, whether employed in the conveyance of goods or passengers, and it is admitted on all hands, with the most unquestionable success. In the Peninsular and Oriental Steam Navigation Company's vessels, the experiment was fairly tried, so far back as 1844, and with the happiest results. The same proof of its effects has been observed in her Majesty's ships Rapid, Rhadamanthus, Childers, Fisgard, Stromboli, Imaum, and Rosamond.

In some of these vessels, and in others not herein mentioned, the effluvia had seriously affected the health of the people on board, causing, as in the Stromboli, oppressive headache, dyspepsia, and sleeplessness. Such was the relief obtained in the latter vessel, that the honorable Captain Plunket has remarked, in a letter dated 22d January, 1845, that were the solution not allowed by government he would provide it at his own cost. In the Rosamond, formerly the Eclair, the surgeon reports that the most trifling catarrhal complaints were frequently accompanied with a low typhoid form of fever until by the copious use of the solution, "a noisome fœtor," which existed on the fore orlop, or troop deck had been removed.*

The apparent effects of the solution in three line-of-battle ships in the Mediterranean was still more remarkable. In two of these, the Albion and Rodney, in which it was only sparingly used, the effluvia from the after holds, in which there were salt provisions, and consequently leakage to a certain extent, was very disagreeable, while the smell from the bilge-water rendered the cockpit cabins scarcely habitable. In the Vanguard, in which it was used according to the directions given, the surface of all the timbers and planking in the hold being thoroughly imbued with it, there was little or no unpleasant effluvia, and the number of her sick were, in consequence, less numerous, and the diseases less severe, than in either of the two other vessels employed in precisely the same duties and localities.

In a communication from Commander Ryder, of a recent date, there is further evidence of the great advantages to be derived from a proper use of the solution in steamers, particularly within the tropics, where disease is more apt to be engendered by the accumulation and decomposition of foreign matters in the holds of these vessels, such as indeed appears to have been the case in her Majesty's ship Growler, which was lately employed in conveying free negroes from the coast of Africa to the West Indies. The surgeon of that vessel states, that he considered the exciting cause of the fever which attacked the greater part of the crew, was the effluvia evolved from the accumulations in her holds and bilges, which (while she was being cleared out at Bermuda) was readily neutralized by the solution, with the effect of thoroughly eradicating the disease.

The value of the solution, as a sanitary agent, I think I may be permitted to state, has been established by the most unequivocal proofs. Noxious gases are speedily deprived of their more poisonous qualities in its presence, while the odors of corrupt or diseased animal substances, even if arising from a living body, are rendered imperceptible or innocuous, if not annihilated; these, there is every reason to believe, are not only frequently the direct source of fatal and malignant diseases, but they are chiefly instrumental in conveying the principles of contagion from one person to another, when from the debilitating influence of a tainted atmosphere they have acquired that property.

---

* Vide Reports printed by Order of the House of Commons.

By a report lately presented to the Commissioners of Sewers, the solution appears to have had a vast superiority over several other deodorizing agents employed in a series of experiments performed under their immediate inspection on cesspools and other receptacles of filth, with the view of rendering the removal of these matters less dangerous to the communities in their neighborhood. In proof of its efficacy under these or similar circumstances, and consequently of its power over those miasmata so fruitful of typhoid fever, I have already submitted for your consideration a number of documents, in which its beneficial effects were freely admitted, and in particular I took the liberty of directing your attention to one from the Chairman of the Board of Watford Union, and to another from the Governor of the Workhouse of that parish; and also to a communication from Dr. Lindsay to the Right Honorable Lord Auckland. These, however, form but a small portion of the documentary evidence now in my possession relative to the deodorizing properties of the solutions.

There is not, so far as I am aware, any means known by which a specific contagion may be made perceptible to the senses, in contradistinction to a fever-exciting miasm; if such an entity does really exist in a separate form, Professor Liebig supposes it most readily attaches itself to certain noxious gases, and by that means propagates the peculiar disease to which it belongs. These gases however, as previously observed, are capable of being destroyed by the solution, and it seems not unreasonable to infer the contagion also; but if this be not admitted, it is clearly demonstrable that, from the want of a proper vehicle of conveyance, it must be rendered at all events infinitely less diffusible. In this light, therefore, the solution may be viewed as a disinfectant. The following documents bear more particularly on these points.

Several instances are reported in which it was considered to have arrested or retarded the spread of contagious maladies. In September last, erysipelas began to infest the patients in the Royal Marine Infirmary at Woolwich; it speedily acquired considerable virulence, became contagious, and carried off several men who were under treatment for other ailments of minor importance. On this being reported, I caused the Deputy Inspector to adopt the usual precautions required on these occasions, and to cause the vapor of the solution to be diffused throughout the wards by hanging up pieces of woollen cloth moistened with it, and by sprinkling it occasionally on the floors and bedding. In the course of a few days, after the employment of these measures, the spread of the disease was arrested, while all open sores, with which these patients were affected, put on a much more healthy appearance than they presented previously to the employment of the solution. Early in 1848, the disease in a malignant form was again introduced to this establishment from one of the ships in the river; still by the constant use of the solution it was prevented from attacking other patients; even those with open buboes escaped, a circumstance so unprecedented as to lead to the conviction of the medical officer in its disinfecting properties.

In the Royal Marine Infirmary at Chatham, typhus fever, introduced from Ireland, appears also to have been held in check by its being freely used in the wards; and a similar result, it was considered, occurred on board the Baretto Junior transport, when crowded with troops on a passage to the West Indies.

The great benefit derived from the application of the diluted liquid to foul sloughing or cancerous sores, stands, however, on a more sure foundation. In the Imaum, it was used with the greatest benefit in the treatment of certain forms of ulcer. In cases of scrofulous ulcer, attended with an "overpowering odor," it was found in the hands of E. Wilson, Esq., to have the effect not only of removing the bad smell, but of promoting a healthy process in the sores.

In the case of a child afflicted with perforation of the intestine, it was of essential service.

In the City of Dublin Hospital its external application has been highly approved of.

I cannot conclude this letter without expressing my firm belief, that a more general use of an agent so innocuous in itself, and yet so powerful in the prevention of disease, is most urgently required in all hospitals or dwellings wherever typhus fever or other contagious diseases exist, as well as in emigrant ships, where it is at all times so difficult to enforce cleanliness, or dispel foul animal miasmata even by proper ventilation.

(Signed) W. Burnett, *Director-General, etc.*

"Unite," Convict Ship, Woolwich, 30th November, 1848.

Sir, — The cholera having happily ceased, we feel it our duty to bring to your notice the advantage resulting from the use of the chloride of zinc, as a destroyer of all fœtid exhalations, and as one of the most powerful disinfectants with which we are acquainted. We used the solution in the "Warrior" and the "Justitia" with good effect, but it was in the hospital ship where we had the best opportunity of practically testing its great utility. This ship is remarkably well ventilated, and the chloride of lime has always been used; we therefore directed its discontinuance, and in its place used the zinc; we consider the advantages of the latter to be great and incontestable: it destroys all offensive effluvia more effectually than the former, leaving the atmosphere around free from all unpleasant smell, while the chlorine from the lime is to many peculiarly offensive. One patient, laboring under abscess of the lungs, was so offensive as to be scarcely approachable; the solution removed all odors, and so contributed to the patient's comfort, that he requested to be allowed to use it as a gargle, and to wash the surface of the body with it. He declared that he found great relief from its use.

The patients were allowed to have either the lime or the zinc, as they liked, to sprinkle the bedding and place in the close stools, but they invariably preferred the zinc, stating that the odor of the lime was offensive, but the zinc had no unpleasant smell.

So strong is our opinion of its utility as a deodorizing agent, that we shall never cease to use it on all occasions when an agent of that kind is required, and we recommend, most strongly, its general adoption in every department of the Convict Establishment. In the naval service it is properly appreciated. To the mercantile marine it would be invaluable; for when offensive smells arise from a hold which cannot be cleansed, the free use of the solution would remove all these, and at the same time preserve the wood-work of the ship, which we believe to be always undergoing decomposition, when noxious effluvia are evolved.

We are, etc.,
(Signed) G. H. Dabbs, *Surgeon, R. N., Medical Superintendent, Woolwich Convict Establishment.*
Edward Nolloth, *Surgeon, R. N.*
Frederick M. Rayner, *Assistant Surgeon, R. N.*

H. P. Voules, Esq., Superintendent of Convicts.

Her Majesty's Dock-Yard at Portsmouth, 14*th July*, 1847.

Sir, — In reply to your memorandum of the 12th instant, wherein I am directed to report the effect of Sir William Burnett's fluid when employed for the removal of noxious smells, such as bilge-water, or when employed as a disinfectant, if such has ever been the case; I beg leave to inform you, that I witnessed its application in February, 1844, for the purpose of removing a more than ordinary stench, of bilge-water and other offensive odors in the "Victoria and Albert" royal yacht, with most complete success. I am informed by the carpenter that she has remained comparatively sweet ever since, and when a bilge-water smell is occasionally perceptible, a slight application of the fluid removes it.

I have heard from some of the officers thereof that it has been used with remarkable benefit in several ships in ordinary for the same purpose.

I have ordered it for very disgusting privies, the effluvia from which it quickly neutralizes.

I have employed the fluid in a severe case of open cancer, the fetor from which was intolerable to the patient and attendants; this it destroyed so long as the dressings were kept moist therewith.

I have witnessed the use of, and employed the fluid as a preservative of specimens of morbid anatomy, and found it just as good as spirits of wine.

I have tried various experiments on a small scale, on noxious gases and offensive odors, with, in every instance, perfect success, from which, and the efficacious results in the before-mentioned instances, there can be no doubt of the fluid possessing potent powers as a corrector of noxious and disagreeable odors; moreover, if sufficiently applied, and kept for a short space of time, so as to permit the timber to imbibe some of it, I am convinced that the fluid will not only correct the bilge-water smell, but have a resisting effect to its future formation.

I have, etc.,
(Signed) JAMES HENDERSON, *Surgeon.*

HYDE PARKER, ESQ., C. B., Admiral Superintendent, etc., etc., etc.

Relative Merits of the Chloride of Zinc and Chloride of Lime as tested in the "Lord Auckland" Convict Ship. Extracted from the Journal of the "Lord Auckland," March, 1847.

The chloride of lime I have always used very extensively, and although it has counteracted disagreeable smells by creating one of its own, I have never found it so beneficial or lasting in its properties as the chloride of zinc. In the first place, the effluvium arising from the former application is any thing but pleasant; and, so soon as the smell of chlorine has ceased to pervade the apartment, I have invariably found that the noxious smells become as prevalent as ever; indeed, a few hours after its use, we have had the disagreeable smells from the closets descending the prison deck; and although used twice a day, morning and evening, and then scrubbed into the wood-work and left wet with the liquid, it has not been a sufficient safeguard against the strong urinous and other smells from the round-houses.

With the chloride of zinc there is no unpleasant smell whatever from its solution; it not only eradicates the fetor from close and confined places, but produces a sweetness and an agreeableness of the air between decks; the lasting properties of one application keeps every thing pure for full forty-eight hours, which I could never obtain by the chloride of lime. And although I have been in the habit of using both remedies in different vessels, even before the application of the latter (chloride of zinc), at the appointed time in the morning, we seldom or ever found any unpleasant smell to warrant such a washing or sprinkling; but with the former (chloride of lime), its effects were gone in a few hours.

(Signed) BENJAMIN BYNOE, *Surgeon, R. N.*

SANITARY PURPOSES AND METHOD OF APPLICATION, AS RECOMMENDED IN ENGLAND.

Objects.	*Mode of applying the Fluid.*	*Proportion of Mixture.*
To purify Sick Rooms and the Wards of Hospitals, Workhouses, Prisons, Factories, and Crowded Places, the between-decks of Ships, etc.	Moisten, with the diluted solution, a piece of flannel cloth, attached to a long rod, and wave it through the air of the apartment for ten minutes at a time; in addition to which, the floor should be mopped or sprinkled over with the same, if necessary, several times a day, and a small quantity of the same dilute solution should be put into the close-stools and bed-pans. The water-closets should also be cleansed with it, and a couple of gallons occasionally thrown down each.	Fluid. Water. 1 to 40
	N. B. *For use on board ships, between decks, and in places where, from imperfect means of ventilation, it may be inconvenient to wet the floors.* — Moisten with the diluted solution thick pieces of flannel cloth — the thicker the better — and wave them through the air of the apartments for ten minutes, and then suspend them in the most convenient manner to the deck-beams, or across the rooms, and keep other similar pieces of cloth thoroughly and repeatedly saturated with the same solution, in flat dishes upon the floors. It is essentially necessary that the bilge-water in the hold of the vessel should be purified agreeably to the instructions given below.	
To purify Fever Wards in cases of death.	When a patient dies of fever, the body should be sponged over with the dilute solution, and the clothes and bedding should be immersed and kept in a sufficient quantity of it, for forty-eight hours, before being washed. The floor should be well mopped over with the solution. Flannel moistened with it (as before recommended,) should be waved through the room.	1 to 40
To purify the Clothes, Linen, etc., of sick persons.	Immerse the articles in the dilute solution, as directed in sick rooms.	1 to 40
To prevent the communication of Infectious Disease.	Sprinkle the dilute solution over the whole of the floor of the apartment, and very slightly on the coverlid of the patient's bed. The clothes used should be immersed in the solution, and afterwards thoroughly dried. Moisten pieces of flannel cloth, and use them as directed above. .	1 to 40
To purify the odor of Night-chairs.	Put half a pint of the dilute solution into the pan previous to its use, and when emptied, rinse it out with a small quantity.	1 to 40
To disinfect dead bodies, and purify apartments preparatory to the visits of Searchers, Undertakers, and Jurymen, and in cases of Post-mortem Examination.	Wash the body occasionally with the dilute solution, which will remove all unpleasant smell, and retard putrefaction.	1 to 40

Objects.	*Mode of applying the Fluid.*	*Proportion of Mixture.*
		Fluid. Water.
To prepare, and arrest the decomposition of Subjects for Dissection.	Immerse the subject in the dilute solution, and let it remain about two hours; after which time it will be purified. As the dissection proceeds, the parts should be sponged over with the same; and, if they are to be preserved, the bloodvessels should also be injected with the solution. .	1 to 40
To disinfect Cesspools, Drains, Water-closets, etc.	Pour in a quantity of the solution in proportion to the capacity of the receptacle. For ordinary water-closets, one gallon of the dilute solution will generally be effectual. For large cesspools the quantity must be increased in proportion to their contents.	1 to 20
To purify Larders and Stables.	Sprinkle the floor, and wash all the wood-work with the dilute solution.	1 to 20
To sweeten musty Casks, Tubs, etc.	Rinse them well with the dilute solution.. .	1 to 20
To destroy Canker and Fungus in Trees.	Apply the solution carefully with a brush, to the parts affected only.	1 to 40
To extirpate Bugs and other Vermin.	Wash the floors and all the crevices with the dilute solution. . . . . The joints, etc., of the bedsteads should be moistened by a brush with a solution consisting of one part of fluid to five parts of water.	1 to 20
To purify Bilge-water and the Holds of Ships.	The quantity to be used at a time is twenty gallons of the dilute solution for each hundred tons of the ship's measurement. It should be poured into the air-holes of the ship, so that it may find its way by the limber-holes into the well; and it should be thrown by a small engine into places where it may be inconvenient to introduce it by other means. A portion may also be poured down the ship's pumps, the boxes being previously removed to allow of its free passage below. The solution should be allowed to remain in the ship twenty-four hours. At the expiration of that time, the ship should be pumped as dry as possible, the well thoroughly cleansed and washed with the solution, and the operation repeated as occasion may require. .	1 to 20

N. B. When floors and other wood-work are washed with the solution, it should not only be freely applied, but well rubbed into all parts of the wood; and the use of soap or soda should be avoided immediately before or after its application.